Alternatives for Wakulla County Management of Blue Crab Processing Solid Waste

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INTRODUCTION

This document is a summary of discussions held at a meeting of Wakulla County blue crab processors, county commissioners, staff, and solid waste committee members, and university researchers on the potential uses of solid wastes from blue crab processing plants. The meeting was held March 8, 1988, in Panacea, Florida, organized by the Sea Grant Extension Program and the Wakulla County Extension Office. The agenda and participants are attached as Appendix I.

Based on a report by the Wakulla County Solid Waste Director (Appendix II), approximately 17% of the solid waste entering the county landfill each year is comprised of processing wastes from the counties' 13 blue crab processing plants. Eleven of these plants were being serviced by Tri-county Refuse of Apalachicola for $12.50/4 cubic yard container/pick-up. The other two plants were bringing their wastes to the landfill themselves in barrels.

Overall, blue crab processing wastes require special handling during daily landfill operations to reduce odors, mainly additional soil coverage. Also, due to normal crab plant operations crab scrap waste is generally delivered to the landfill late in the day making handling difficult before landfill closing time. As a result of these handling problems, blue crab processing wastes are presently costing an estimated 25% of the landfill operating budget per month during peak production months, April - November.

BLUE CRAB PROCESSING WASTE OUTPUT

Three types of wastes are produced by county blue crab processors: 1) scrap (shell pieces, legs and viscera) from meat picking operations (all plants), 2) shell pieces and brine from mechanical claw machines (3 plants), and 3) viscera plus broken shells from shell (carapace) cleaning operations (4 plants). The scrap from meat picking operation provides the bulk of the waste. Based on a survey of 6 of the 13 county blue crab plants, approximately 3,000 - 3,500 tons of blue crab scrap were produced in 1987. During the peak months approximately 90 tons are produced each week as compared to 35 tons (or less) produced per week during the slow months.

The waste output figures were based on estimates of live blue crab weight processed by each of the counties' crab plants in slow months versus peak months. A 33% waste estimate per pound of live blue crab was used. In this county, 100 pounds of live blue crab yields 20% water when cooked, 12-14% meat, 35% shell (carapace) leaving 31-33% waste.

The output figures were thought to be higher than the actual output for the county by the blue crab processors present. A more detailed survey needs to be

done to determine an accurate amount of solid waste produced as well as in surrounding counties. A similar Sea Grant Extension survey completed in 1977 (Cato, et al) indicated that 1,300 and 2,156 tons of crab scrap were produced in Wakulla County in 1976 and 1977, respectively. During 1977, 68/tons/week were produced during the peak season and 19 tons/week during the slow period.

MANAGEMENT ALTERNATIVES

The participants of this meeting evaluated, qualitatively, the benefits and drawbacks of nine alternative uses and disposal of blue crab processing wastes. The items discussed and the relative pros (+) and cons (-) are shown in Table 1. All alternatives examined required further study prior to implementation.

Following evaluation, the alternatives were prioritized into three general categories based on the number of positive attributes assigned: 1) dehydration, 2) wet form uses and 3) ocean disposal.

Dehydration

Dehydration had the greatest number of positive aspects, especially if linked with incineration which would reduce fuel costs. The greatest benefit of dehydration was that the end product could be sold to offset operating expenses. This method also appears to have the best chance for attracting outside funding and private sector participation. See Table 2 for cost breakdown.

The value of crab meal fluctuates proportionally with the value of soybean meal on the commodity exchanges. At the time of the meeting crab meal prices were at $100/Ton. Based on the experience of Mr. Noah Posey, who operated a crab meal plant in the county for 10 years, (1974-1983) the price varied from a low of $95/Ton annually to a high of $200/Ton in 1983. Because of droughts expected during summer months, prices could reach that high again.

It takes approximately 2.5 Tons of crab scrap to produce 1 Ton of the finished crab meal at 10% moisture. If the county produced only 2,500 Ton/Year that would equal 1,000 Tons of finished crab meal product. At $100/Ton the county would make $100,000. Subtracting operating expenses (estimated at $80-85/Ton - see Table 2) the county could realize a net profit of 15-20,000 dollars/year. A detailed feasibility study of this process would be necessary to determine an accurate cost/benefit value for the county.

Wet Form Uses

Several wet form uses exhibited potential, particularly land application and composting. Land application would be the cheapest method of disposal if permits could be obtained and cooperative landowners could be found. If properly spread and tilled into the soil, odors would be minimal and benefits to the landowner would be worth the cost of tilling. Composting, as in dehydration, would produce a marketable product, but would require a cheap source of straw or sawdust as a bulking agent to make this economical (see Table 3 for cost breakdown).

Both of the above wet form alternatives would be most practical if arrangements could be made with large landowners in the county, such as St. Joe Paper

Company, Apalachicola National Forest (USDA), or St. Marks National Wildlife Refuge (USFWS) for either land application areas or a source of bulk materials (sawdust/straw).

Feed applications, although showing equal number of positive attributes to land application and composting, had several drawbacks that make them less attractive than the others. Odors were the primary concern and costs associated with controlling odors, e.g. ensiling. A further drawback was transportation costs to areas where livestock could be fed, since Wakulla County and surrounding counties have few cattle/hog operations that could handle the daily output of crab processing wastes.

Ocean Disposal

Finally, ocean disposal had the fewest positive aspects, primarily due to difficulties in permitting, on-shore handling and high costs of equipment and maintenance. The major benefit would be short term gains in biological productivity in the disposal areas; e.g. on artificial reefs. Long term effects could not be addressed due to lack of information on the subject, and would need to be studied before it would be approved by state agencies. Federal agencies (EPA and Coast Guard) currently do not require permits if disposal is beyond 12 miles from shore. See Table 4 for cost breakdown.

A major drawback was that a program started to dispose of crab scrap offshore would be a major financial drain on county budgets, or the crab processors, to cover this expensive operation.

SUMMARY OVERVIEW

A Maryland Sea Grant report, "Composting Blue Crab Processing Waste", (Cathcart, et al, 1984), provides the best comparison of the above methods of disposal (see Tables 5, 6, and 7). Table 5 compares costs of disposal of several of the above methods discussed for Wakulla County (i.e. composting, land application, dehydration and ocean disposal) in comparison to current landfilling. Table 6 compares value of products generated from crab processing wastes, and Table 7 compares net cost, or value, of those same methods of disposal listed in Table 5. Although it would need to be studied to determine how relative these costs are to the Wakulla County situation, there is enough information given to determine what the county could hope to expect from each method if implemented as a management alternative for crab processing wastes.

Based on the cost/value estimates of the Maryland study alone, the ranking of management alternatives would be: 1) composting (at premium market value only), 2) dehydration, 3) land application, 4) landfill, 5) offshore dumping, 6) composting (at lowest market value). Comparing these cost/values to the information discussed at the Panacea meeting, the ranking for Wakulla County would be: 1) dehydration, 2) land application, 3) composting, 4) offshore dumping, 5) landfill.

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TABLE 1: Evaluation of Alternatives for Crab Scrap

	Dehydration		Wet Form Uses					Ocean Disposal	
Items Evaluated	A	B	A	B	C	D	E	A	B
Potential	+	+	-	+	+	+	+	+	+
Sites	+	+	-	-	+	+	+	+	+
Transportation	+	+	-	-	-	-	-	-	-
Odor	-	-	+	+	+	+	+	-	-
Costs	+	++	-	-	+	+	+	-	-
Grants	+	+	N/A	+	?	N/A	N/A	?	+
Permits	?	?	?	+	?	?	N/A	+	-
Needs Study	Y	Y	Y	Y	Y	Y	Y	Y	Y
TOTAL POSITIVES	5	6	1	4	4	4	4	3	3

A. Dehydration alone
B. Dehydration with incineration

A. Swine (silage)
B. Livestock
C. Redfish/catfish
D. Land application
E. Compost

A. Offshore
B. On artificial reefs

Legend

+	=	positive aspect
-	=	negative aspect
Y	=	yes
N/A	=	not applicable
?	=	unknown, considered a negative

TABLE 2: Cost Breakdown for a Dehydration Plant

PLANT INSTALLATION

Item	Cost
7.5′ x 22′ drum dryer	$ 75,000.
Accessory equipment	75,000.
Scrubber	75,000.
Installation	55,000.
Total	$280,000.

OPERATING COST BREAKDOWN

Fuel:	Fuel oil	$ 40./Ton crab meal
	LP	45./T.
Personnel (2-3 persons)		35./T.
Maintenance		5./T.
Total		$ 80-85./Ton crab meal

Source: Information based on figures provided by Baker-Rullman Mfg., Inc., Heil Dehydration Systems, Watertown, Wisconsin

TABLE 3: Costs for a 20-Ton Per Day Crab Scrap Composting Facility

	Quality	Cost
Capital Costs		
Land	4.5 acres	$ 13,500
Asphalt Pad	4.5 acres	184,500
Blowers and Timers	14	2,100
Pipe (PVC)	1,400 feet	3,025
Garden Shredder	1	8,000
Tractor	1	26,000
Total Capital Costs		$237,125
Operating Costs		
Straw ($50/ton)	1,750 tons	$ 87,500
Hardwood sawdust ($18/ton)	1,750 tons	(35,000)
Ferrous Sulfate	34 tons	6,800
Labor	1.0 man-year	18,000
Fuel & Elec.		10,000
Maint., Repair & Insurance	10% of fixed cost	23,700
Miscellaneous		4,000
Total Operating Costs		$150,000
		($ 97,500)*
Average Cost/Ton Compost		$ 74
		($ 53)*
Value of Blue Crab Compost **		
Average value of components of compost		$ 12/ton
(e.g. Nitrogen, Phosphorus, Potassium, Calcium)		($ 62/ton)
Comparison to value of sewage sludge compost		$ 35/ton
		($ 39/ton)
Substitute for potting soils, fertilizers, etc.		$150/ton
		(+76/ton)

* If computing with hardwood sawdust.

**Net cost or (value) per ton of compost in parantheses.

Source: Cathcart, et al, 1984.

TABLE 4: Cost Breakdown for Ocean Disposal

OCEAN DISPOSAL FIXED COSTS

Item	Cost		
	New	Used	56′ LCM-6**
Sea going tug (85′-100′)	$1,000,000.	503,000.*	$ 3,000.
Sea going barge (100′x26′7′)	300,000.	103,000.*	
Slurry pump	35,000.	same	same
Storage bins or refrigeration	25,000.	same	same
Total	$1,360,000.	666,000.	$63,000.

OPERATING COST BREAKDOWN (per annum)

Insurance (2% of vessel worth)	$ 26,000.	12,000.	$ 1,000.
Personnel (Capt., 5-man crew)	138,000.	same	43,000. (2-man)
Fuel ($50/hr. @ 10 hr./day, 276 day/year)	138,000.	same	70,000. ($25/hr.)
Maintenance (30-45 days/year)	40,000.	65,000.	50,000.
Total	$ 342,000.	353,000.	$164,000.

*Price includes surveyor cost of vessel

**LCM was available for a short period of time from state surplus. Other surplus vessels may be available on occasion.

Source: Figures based on personal communication with project coordinator for FL DNR oyster shell planting program in Apalachicola, FL; commercial marine tug captain in Panama City, FL; and FSU Academic Lab Diving Coordinator

TABLE 5: Estimated Costs of Crab Scrap Disposal

Method	Costs			Source
Composting[1,2]	$131 ton (330)	$74 ton (2474)	$64 ton (4947)	Cathcart, et al, 1984
Landfill	$ 27.56 day		$16.80 ton	Maryland Sea Grant Survey (1981)
Direct Farmland Application	$ 14.00 day		$ 5.28 ton	Maryland Sea Grant Survey (1981)
Crab Meal Production[3]	$155.96 ton (600)	$92.71 ton (1200)	$71.62 ton (1800)	Murray and DuPaul (1981)
Offshore Dumping[4,5]	$ 75.00 day		$33.50 ton	G. Krantz (pers. comm.)
Delivery to Crab Meal Plant	$ 6.41 ton (Hampton Roads, VA)		$10.30 ton (Accomack, VA)	Coale (1981)

1 = $/day are average per processor
2 = numbers in parenthesis correspond to tons of output per year
3 = costs/ton of finished product before sale
4 = very rough estimate based on experimental dumping by the State of Maryland in 1982
5 = adjust to 1981 dollars by Producer Price Index for prices paid by farmers

Source: Cathcart, et al, 1984.

TABLE 6: Estimated Value of Crab Scrap Products

Product	Value	Source
Crab Meal	$100/Ton meal (15 month average $131/Ton) (1/80-3/81)	Murray and DuPaul (1981)
Liquid Fish Fertilizer	$100/Ton crab scrap	
Chitin	$150/Ton crab scrap	
	$250/Ton crab	Fryer (1981)
Direct Land Application	$15-20/Ton crab scrap	Brinsfield (1981)
Compost[4]	1) $ 12/Ton[1] 2) $ 35/Ton[2] 3) $150/Ton[3]	Cathcart et al (1984)

1 = component method using the average value
2 = perfect substitute for sewage sludge
3 = substitute for potting soils, fertilizers, etc. (average)
4 = adjusted to 1981 dollars by Producer Price Index

Source: Cathcart, et al, 1984.

TABLE 7: Estimated Net Cost (Value) Per Ton for Different Methods of Crab Scrap Disposal

Method	Net Cost (Value)[1] ton
Composting[2]	$52 to ($86)
Landfill	$16.80
Direct Farmland Application	($12.22)
Crab Meal Production[3]	($28.38)
Offshore Dumping	$33.50

1 = in 1981 dollars
2 = assuming 4,947 Ton/Year plant and a range in value for compost from $12 to $150/Ton
3 = assuming an 1,800 Ton/Year operation and $100/Ton value for meal

Source: Cathcart, et al. 1984.

APPENDIX I

MEETING ON: Alternatives for Wakulla County Management of Solid Blue Crab Waste

WHEN: Tuesday, March 8, 1988 / 10:00 a.m. - 2:00 p.m.

WHERE: Posey's Beyond the Bay, Highway 98 in Panacea, FL

TENTATIVE AGENDA

AM Introduction of Participants

Present Status of County Landfill Operation

Present Output of Solid Waste from Blue Crab Processing Plants

Pros and Cons of Management Alternatives:

1. Raw form uses
    a. Swine feed supplement (e.g. ensiling)
    b. Livestock feed supplement
2. Ocean Dumping
    a. Offshore (Federal waters)
    b. On artificial reefs
3. Dehydration
    a. Feed stuff supplement (e.g. aquaculture, poultry, swine)
    b. Fertilizers
    c. Compost material
4. Incineration

LUNCH Dutch Treat Special

PM Continue Discussion of Alternatives, if necessary

Prioritize Waste Management Options

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APPENDIX II

September 29, 1987

TO: Linda Day, County Coordinator
Wakulla County Board of Commissioners

FR: Cal Jacobs, Director
Solid Waste

RE: Crab Waste

For the immediately preceding five (5) months we have been battling the persistent problem of the disposal of crab waste generated by our commercial processors and tendered to us at the Lower Bridge Landfill facility.

I would briefly, if possible, outline our difficulties in handling this waste, on a daily basis; the problems, complaints and inordinate expenditure of landfill area and the additional expense attendant to the handling of this particular byproduct.

The crab processors of all sizes like to open early and work their full shift to closing time, generally 5:00 P.M. and haul their waste to the landfill just at closing time 5:00 P.M. By that time we will have put in place our face and top cover preparatory to closing. Crab waste arriving at this time must be placed on the face of the fill rather than co-mingled/integrated with the household garbage and buried beneath it. This then necessitates a large volume of cover soil to curb the smell over the face of the fill. This consumes, daily, a disproportionate amount of fill capacity, shortening its life span. We receive an average of 500 Cu. Yds. per week from seven crab processors and all of it in the afternoon, with larger houses' waste arriving from 4:00 P.M. until 5:00 P.M.

Based upon the volume of crab waste compared to the total number of cubic yards of waste received each month, this crab waste represents 16.67% per cent of our total volume of 6,220 Cubic Yds. The cost of handling all waste in the month of August was $13,035.84. It is impossible at this time to extract from this figure the pure cost, but considering complaints, chemical costs, additional face cover, loss of fill life, and the disproportionate amount of time required to handle crab waste that it will exceed 25% of our total monthly costs.

In wet weather it is impossible to render the face and top surface of the face odorless even with the use of large volumes of lime. The fragments continue to surface and emit their strong pungent odor. Additional soil cover would and does further limit the life of the cell.

In an attempt to conserve space, and fill dirt and to address properly the odor problem we are again burying the crab waste in separate fill pits daily. We will have to double the handling time and expense as we will await the cold winter months; exhume this waste which will be still extremely rotten and strong and only then place it in the working face in the mornings to be covered by a full days' household garbage and end of day soil cover.

There appears to be no way of reaching an accord with these Seafood Houses as they feel we should not force them to shut-down early or they to carry over any amount of their waste until the next day. They simply wish to transfer the odor problem attendant to their operation to the landfill and wish the county to absorb the extreme expense of specialized and time consuming disposal of a byproduct created by their industry.

This is a special type of waste and consideration should be given by the county/state to a fee system designated for the disposal of nuisance waste requiring additional space and services to render it acceptable for public landfill deposit. I am certain they would find this objectionable.

To accommodate these crabbers and conserve the life of our landfill we would have to leave fully 50% of our household garbage sidelined until their late arrival. After they dumped we would then need two to three hours to push our household garbage in and cover it. Then compact it, put in place our face cover preparatory to our next days operation. To entertain the expense, for this specialized handling, seems imprudent and fiscally unsound, without some contribution or assistance from the producers of this special waste. I do not feel the county or its constituency should have to carry the expense nor the total impact of a specialized landfill operation to accommodate this particular industry.

Hence my prior recommendation of a special fee for the handling of their particular waste.

In the absence of additional revenues and a frozen budget alternatives are needed. In the absence of a sound fiscal alternative we will need monetary assistance to accomplish this handling of a highly offensive byproduct produced by the chief contributing industry to our county's economy.

I would appreciate your assistance and any advice in this highly sensitive issue.